

3.2.7 Noise

3.2.7.1 Regulatory Setting

NEPA and CEQA provide the broad basis for analyzing and abating highway traffic noise effects. The intent of these laws is to promote the general welfare and to foster a healthy environment. The requirements for noise analysis and consideration of noise abatement and/or mitigation, however, differ between NEPA and CEQA.

California Environmental Quality Act

CEQA requires a strictly baseline versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless those measures are not feasible. The rest of this section will focus on the NEPA 23 CFR 772 noise analysis; see Chapter 4 of this document for further information on noise analysis under CEQA.

National Environmental Policy Act and 23 CFR 772

For highway transportation projects with FHWA (and Caltrans, as assigned) involvement, the federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations include noise abatement criteria (NAC) that are used to determine when a noise impact would occur. The NAC differ depending on the type of land use under analysis. For example, the NAC for residences (67 A-weighted decibels [dBA]) is lower than the NAC for commercial areas (72 dBA). Table 3.2.7-1 lists the NAC for use in the NEPA 23 CFR 772 analysis.

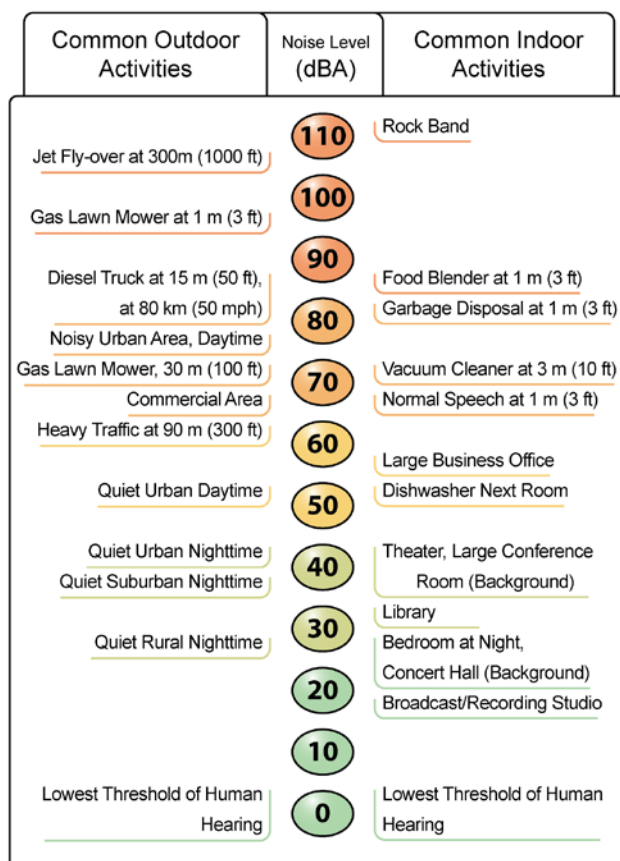
Figure 3.2.7-1 lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise levels discussed in this section with common activities.

Table 3.2.7-1: Noise Abatement Criteria

Activity Category	NAC, Hourly A- Weighted Noise Level, dBA $L_{eq}(h)$ ¹	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Exterior	Developed lands, properties, or activities not included in Categories A or B above.
D	–	Undeveloped lands.
E	52 Interior	Residence, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

¹ $L_{eq}(h)$ = equivalent sound level over 1-hour.

Source: Parsons, 2011k and 2011l.



Source: Caltrans SER, 2010.

Figure 3.2.7-1: Noise Levels of Common Activities

According to the Caltrans *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects, August 2006*, a noise impact occurs when the predicted future noise level with the project substantially exceeds the existing noise level [defined as a 12 dBA or more increase] or when the future noise level with the project approaches or exceeds the NAC. Approaching the NAC is defined as coming within 1-dBA of the NAC.

If it is determined that the project will have noise impacts, then potential abatement measures must be considered. Noise abatement measures that are determined to be reasonable and feasible at the time of final design are incorporated into the project plans and specifications. This document discusses noise abatement measures that would likely be incorporated in the project.

Caltrans *Traffic Noise Analysis Protocol* sets forth the criteria for determining when an abatement measure is reasonable and feasible. Feasibility of noise abatement is basically an engineering concern. A minimum 5-dBA reduction in the future noise level must be achieved for an abatement measure to be considered feasible. Other considerations include topography, access requirements, other noise sources, and safety considerations. The reasonableness determination is basically a cost-benefit analysis. Factors used in determining whether a proposed noise abatement measure is reasonable include residents' acceptance, the absolute noise level, build versus existing noise, environmental impacts of abatement, public and local agencies input, newly constructed development versus development pre-dating 1978, and the cost per benefitted residence.

3.2.7.2 Affected Environment

This section has been prepared based on the Noise Study Report (NSR) (June 2011), Amendment #1 Noise Study Report (May 2012), Amendment #3 Noise Study Report (July 2014) (includes Amendment #2), Noise Abatement Decision Report (NADR) (September 2011), Supplemental NADR (December 2014), and Vibration Study Report (December 2014). These studies were required to satisfy Caltrans Traffic Noise Analysis Protocol (2006), which is based upon FHWA noise regulations (23 CFR 772). The proposed project is considered a Type I project by 23 CFR 772 because of the proposed mainline lane additions and changes to the alignments that would occur at the I-405 ramps. In addition to the existing traffic noise levels, the technical report analyzes potential traffic noise impacts for the No Build Alternative and three build alternatives for year 2040.

Existing Noise-Level Measurements

A field investigation was conducted to identify frequent outdoor use areas that could be subject to traffic noise impacts. Land uses in the study area were categorized according to FHWA criteria.

Multiple outdoor noise measurements were conducted throughout the study corridor to evaluate existing noise levels and to calibrate the computer noise model. The sound level meters used for the noise measurements included Larson Davis models 812, 820, and 870; and Brüel & Kjær models 2238 and 2250. Details about the instruments used during this investigation are provided in the NSR.

Specific measurement sites were chosen to be representative of receiver sites with similar topography, orientation to the highway, exposure angles, etc. During site selection, attention was directed toward avoidance of areas where noise from barking dogs, air conditioners, pool pumps, car alarms, or other unusual sources were likely to affect measurements. Noise measurements were conducted in conformance with guidelines outlined in Caltrans' *Technical Noise Supplement* (TeNS) and FHWA's *Measuring of Highway Related Noise* (FHWA-PD-96-046). Details of measurement procedures can be reviewed in the NSR.

Short-term monitoring was conducted at 61 locations in June 2010 and 1 additional location in August 2010. Noise measurements were taken for a 20-minute duration at each site, mostly at Activity Category B areas. Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session using a Kestrel 3000 portable weather station. The primary objectives of the short-term measurements were to evaluate the existing noise environment and calibrate the traffic noise prediction model.

Noise measurement results, presented in Appendix N (Noise Information; Section N1 Existing and Future Noise Levels), indicate that several sites within the study area already approach or exceed the NAC of 67 dBA. The short-term measurement locations are shown on the Summary Recommended Soundwall Location figures (Sections N3, N4, and N5) in Appendix N.

Long-term (continuous 24-hour) noise measuring results are shown in Appendix N. For these measurements, monitoring was conducted at 30 locations to identify variations in sound levels throughout the day. The long-term measurement locations are also identified in the Recommended Soundwall Location figures. The long-term measurements were conducted to observe hourly noise distribution and identify the peak noise hours.

The FHWA Traffic Noise Model Version 2.5 (TNM 2.5) was used for the noise computations (FHWA 2004). TNM 2.5 inputs are based on a three-dimensional grid created for the study area. All roadway, barrier, terrain lines, and receiver points are defined by their x, y, and z coordinates and coded as line segments defined by their end points. Receivers, defined as single points, are modeled at a height of 5 ft above ground elevation. The computer program also requires inputs for traffic volumes, speeds, and vehicle types (i.e., cars, medium trucks, and heavy trucks). See

Appendix C of the NSR for a comprehensive listing of the future traffic volumes and traffic distribution per direction of travel used for the noise analysis for the future No Build Alternative and build alternatives.

Traffic on I-405 was recorded using a camcorder during 32 noise measurements; later, vehicles were classified and counted as automobiles, medium-duty trucks, or heavy-duty trucks. TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations to validate the accuracy of the model. Traffic volumes counted during each 20-minute measurement period were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding study area roadways to simulate the noise source strength at the roadways during the actual measurement periods. Modeled and corresponding measured sound levels were then compared to determine the accuracy of the model and if additional calibration of the model was necessary. Detailed information about the noise model calibration process is provided in the NSR.

Existing Noise Environment

For this assessment, the relatively flat study area corridor was divided into six segments according to major freeway interchanges. Along the entire corridor, soundwalls and/or masonry property walls provide freeway traffic noise reduction to most of the residences and other Activity Category B land uses. The existing and future noise levels are provided in Appendix N (Section N1).

Segment 1 – I-405 South of Bristol Street to Euclid Street, SR-73 South to Bear Street: The land uses along I-405 in this area include commercial development such as South Coast Plaza (Activity Category C), as well as single- and multi-family residences, three neighborhood parks, and a hotel (Activity Category B). There is also a patch of farmland on the northbound side of I-405 between Fairview Road and Harbor Boulevard. The single-family residences and parks are largely on the southbound side of I-405, except between Bear Street and Fairview Road where there are single- and multi-family residences. Located along SR-73 between Bear Street and the I-405 interchange are single-family residences. Throughout this segment, soundwalls and masonry property walls provide freeway traffic noise reduction to most of the residences and other Activity Category B land uses.

Segment 2 – Euclid Street to Magnolia Street: Between these two interchanges, the adjacent areas within the corridor are predominantly residential, including single-family residences, townhouses, and apartments, as well as outdoor use areas of Fountain Valley High School, a preschool associated with Huntington Baptist Church, Los Alamos Park, and outdoor pool areas of Courtyard Inn and Residence Inn. Most of the residential developments have masonry

property walls, as well as existing soundwalls. At the south end of this segment between Euclid and Ward streets, the surrounding areas are commercial.

Segment 3 – Magnolia Street to Bolsa Avenue/Goldenwest Street: This area along the project corridor is largely residential, including single-family residences, apartment complexes, and a mobile home park, and it also includes Pleasant View and College parks. Throughout this area, existing property walls and/or soundwalls protect most of the outdoor use areas from freeway traffic noise.

Segment 4 – Bolsa Avenue/Goldenwest Street to SR-22/Valley View Street, SR-22 East to Springdale Street: In this segment of the highway, the adjacent land use is predominantly residential with pockets of commercial, including Westminster Mall. The land uses along I-405 include single-family residences, four schools, three neighborhood parks, an outdoor pool area at Motel 6, and a mobile home park. Land uses along SR-22 include single-family residences and two mobile home parks, as well as an apartment complex without any frequent outdoor use areas exposed to traffic noise. Existing masonry property walls and soundwalls provide shielding from freeway traffic noise at most of the residential land uses.

Segment 5 – Valley View Street to Seal Beach Boulevard: Activity Category B land use areas in this segment along I-405 consist of single-family residences, Shapell Park, Blue Bell Park, Seal Beach Tennis Court Center, and Sunrise Senior Living. Other land uses along this segment of the corridor include the Old Ranch Golf Practice Range and NAVWPNSTA Seal Beach along the eastbound side. Existing soundwalls and masonry property walls provide freeway traffic noise reduction at Activity Category B land uses.

Segment 6 – Seal Beach Boulevard to I-605, I-605 North to South of Katella Avenue: Along I-405 in this segment, the predominant Activity Category B land use is single-family residential and multi-family residential of Leisure World Retirement Community. Other Category B land use areas include a gazebo area of First Christian Church of Leisure World. Also located in this area is the Leisure World Library, which is an Activity Category E land use. The residential land uses are protected from freeway traffic noise by existing soundwalls and property walls.

3.2.7.3 Environmental Consequences

Traffic noise is a function of traffic type, volume, and speed. Generally, noise increases with increased speed and with higher volumes of traffic; however, at much higher volumes, travel speed decreases (i.e., stop-and-go conditions), so the worst-case noise levels are experienced when there is an optimum balance between the volume and speed. For purposes of determining

noise impacts, the worst-case traffic noise occurs when traffic is operating under LOS C conditions, when traffic is heavy but remains free flowing.

In the NSR analysis, LOS C volumes are used for main lanes, HOV lanes, and auxiliary lanes, but predicted design-year (2040) volumes are used for ramps and connectors; however, volumes on the ramps are capped at 1,000 vphpl. Appendix C in the NSR presents a comprehensive listing of the future traffic volumes and traffic distribution per direction of travel used for the noise analysis. Traffic noise levels with the proposed project are compared to existing conditions and to the design-year no-build conditions, as well as NAC, to identify traffic noise impacts under Title 23 CFR 772. The comparison to no-build conditions indicates the direct effect of the proposed project.

Modeling results indicate that predicted traffic noise levels ($L_{eq[h]}$) for the design-year build conditions approach or exceed the NAC of 67 dBA for Activity Category B land uses at numerous frequent outdoor use areas near I-405 throughout the study corridor; therefore, traffic noise impacts are predicted to occur at Activity Category B land uses within the study area, and noise abatement must be considered at those locations.

Generally, the noise analysis was conducted with barrier heights ranging from 8 to 16 ft. Throughout the study area, existing soundwalls currently protect most of the outdoor frequent use areas from freeway traffic noise. These existing soundwalls can be categorized as (1) soundwalls that would remain; and (2) soundwalls that would need to be demolished due to the proposed project. For those soundwalls that would remain intact because freeway widening would not encroach upon them, analysis was conducted for barrier heights above the existing heights at the same location. For soundwalls that would need to be demolished due to either freeway widening or other work details, such as the construction of retaining walls, it has been assumed that in-kind replacement soundwalls would be constructed as part of the proposed project. These in-kind replacement soundwalls included in the noise analysis would be the same length and height as the soundwall it is replacing but at a new and typically similar location. The in-kind replacement soundwalls were then incrementally analyzed using 2-ft-height increases to determine whether a 5-dB noise reduction could be achieved.

The identified feasible soundwalls can generally be categorized as (1) new soundwalls; (2) replacement soundwalls that would be constructed at new locations due to project widening and at greater heights than existing walls; and (3) lateral extensions of either new soundwalls or replacement soundwalls. There are also soundwall extensions that would generally not be considered feasible, but they were evaluated in the noise analysis because the project would create gaps due to the removal of embankment material at some freeway overpasses, resulting in an increased exposure to sensitive receptors at frequent outdoor use areas.

Permanent Impacts (Abatement Decision Analyses)

No Build Alternative

Noise in the study area is dominated by traffic on I-405, and there are numerous soundwalls along both sides of the freeway. Additional soundwalls within the northern portion of the corridor will be constructed as part of the SR-22 WCC Project. The bordering communities within the corridor are already impacted by highway noise, and these conditions are projected to worsen. Noise measurement results indicate that traffic noise levels at various locations along the freeway corridor either approach or exceed the aforementioned NAC of 67 dBA for frequent outdoor use areas during the peak noise hour. Noise modeling results indicate many Category B land use locations within the corridor that are projected to experience a 1- to 3-dB increase under the Design Year (2040) no-build condition.

Except for the SR-22 WCC Project, future operation of alternative improvements to I-405 would not occur under the No Build Alternative; therefore, abatement associated with the proposed project would not be implemented. However, residents would be able to request soundwalls through OCTA's Freeway Soundwall Retrofit Program, where their noise situation would be assessed and appropriate measures determined. Existing adverse noise conditions at frequent outdoor use areas along both sides of I-405 within the study area corridor would continue under this alternative. Along most of I-405, noise conditions would worsen, with several areas projected to experience an increase of 2 to 3 dB by the Design Year (2040).

Alternative 1

The traffic noise analysis indicates that residential areas and park and recreation facilities, as well as six schools and one motel, would be impacted by this alternative (i.e., the noise level would approach or exceed the NAC). Without any additional barrier protection, noise analysis results indicate that the proposed project would raise noise levels in some areas from 3 to 6 dB compared to the Design Year (2040) No Build Alternative. While all of the alternatives would result in adverse noise impacts, from a numerical perspective Alternative 1 would exceed the NAC at fewer frequent outdoor use locations than Alternatives 2 and 3 because it is narrower than the other alternatives. Impacts to other Category B types would be comparable between the build alternatives. The proposed project would not cause a substantial noise increase (i.e., 12 dB).

The preliminary noise abatement decision for each acoustically feasible soundwall identified within the NSR and NADR for Alternative 1 is provided below. As such, the physical characteristics of noise abatement described herein also may be subject to change. If pertinent parameters change substantially during the final project design, the preliminary noise abatement

decision may be changed to include abatement in the final project design. A final decision on whether and how to construct noise abatement would be made upon completion of the project design. The locations and heights of the recommended soundwalls from the NADR are summarized in Table 1 and shown in the figures in Appendix N (Sections N1 and N3).

Euclid Street to Magnolia Street

- **Soundwalls S708, S710, and S718:** These soundwalls, which act as a system, would be located along the northbound I-405 edge of the shoulder and ROW line. Soundwall S710 is an in-kind replacement of the existing 375-ft-long soundwall and would be reconstructed regardless of cost. Soundwall S708 is 240 ft long and extends the coverage of Soundwall S710 to compensate for the encroachment of the widening on the embankment at Talbert Avenue. Soundwall S718 is 1,405 ft long and extends the Soundwall S710 protection north along the off-ramp to Brookhurst Avenue. The minimum required wall height for Soundwall S708 to meet the feasibility criterion is 12 ft, as shown in Figure 8 in Appendix A1 of the NSR, and increasing the height of this wall would not provide any additional acoustic benefits; however, building Soundwall S718 as a uniform 16-ft-high wall would provide an additional 1-dB of noise reduction for residences behind this wall. The estimated total construction cost of Soundwall S708 at 12 ft high and Soundwall S718 at 16 ft high would be \$584,000, which is less than the maximum reasonable allowance of \$945,000.

With consideration of the acoustic benefit and the incremental cost, Soundwall S708 is recommended to be a 12-ft-high masonry wall and Soundwall S718 is recommended to be a 16-ft-high masonry wall, as shown in Figure 8 and Table 1 in Appendix N3.

- **Soundwall S733:** Soundwall S733 would be located at the shoulder of the southbound off-ramp to Brookhurst Street. Figure 8 in Appendix A1 of the NSR shows the minimum heights and length of Soundwall S733 to provide feasible abatement. The estimated total construction cost of this soundwall is \$112,000, which exceeds the reasonable allowance of \$43,000.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S733 is not reasonable; therefore, it is not recommended.

- **Soundwall S746:** Soundwall S746 would extend an existing soundwall 195 ft to the south to compensate for the encroachment of I-405 onto the existing overpass embankment and provides 5 dB of protection for a single-family residence, as well as a

preschool playground. The estimated total construction cost of Soundwall S746 is \$59,000, which is less than the reasonable allowance of \$98,000. Increased wall height would not provide any additional acoustic benefits. Figure 9 in Appendix N3 shows the height and length of Soundwall S746 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, Soundwall S746 is recommended to be a 12-ft-high masonry wall, as shown in Figure 9 and Table 1 in Appendix N3.

- **Soundwall S747:** Soundwall S747 would extend an existing property wall 750 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment. The southern portion of this wall (S747A) replaces the 10-ft-high (430-ft-long) portion of an existing property wall with a 12- to 16-ft-high soundwall, and the northern portion would be a new soundwall (S747B), providing traffic noise reduction for the Valley Vista High School. The minimum required wall heights for Soundwall S747 to meet the feasibility criterion are as shown in Figure 9 in Appendix A1 of the NSR. The estimated total construction cost of Soundwall S747A as proposed with a combination of 12- to 16-ft sections would be \$137,000, which exceeds the reasonable allowance of \$98,000 for this segment of the wall; therefore, it is not recommended. The existing 10-ft-high property wall provides some level of noise protection for these residences. The estimated total construction cost of Soundwall S747B as proposed at 16 ft high would be \$119,000, which exceeds the reasonable allowance of \$98,000; however, because the reconfigured embankment of Slater Avenue would expose the nearby high school to increased traffic noise, construction of this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S747A is not reasonable; therefore, it is not recommended, and Soundwall S747B is recommended to be a 16-ft-high masonry wall, as shown in Figure 9 and Table 1 in Appendix N3.

- **Soundwall S765:** Soundwall S765 would extend an existing 16-ft-high soundwall 215 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of three single-family residences to additional traffic noise predicted under Alternative 1; therefore, it is recommended. Figure 9 in Appendix N3 shows the location and height of Soundwall S765.

With consideration of the acoustic benefit and the incremental cost, Soundwall S765 is recommended to range from a 14- to 16-ft-high masonry wall, as shown in Figure 9 and Table 1 in Appendix N3.

- **Soundwall S766:** Soundwall S766 would extend an existing 14-ft-high soundwall 145 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of six single-family residences to additional traffic noise predicted under Alternative 1; therefore, it is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S766 is recommended to be a 14-ft-high masonry wall, as shown in Figure 9 and Table 1 in Appendix N3.

- **Soundwall S776:** For Alternative 1, Soundwall S776 would be 251 feet long and located at the edge of the shoulder of the northbound off-ramp to Warner Avenue. The estimated total construction cost of this 12-ft-high wall is \$82,000, which exceeds the reasonable allowance of \$39,000. This soundwall was initially found not reasonable due to cost; however, El Dorado Preschool opened during preparation of the NSR, Amendment 3, and it was found that the predicted peak-hour noise level at the playground would be 75 dBA without a soundwall, which is considered a severe impact. Where severe impacts are identified, unusual and extraordinary abatement must be considered, even if the noise abatement is determined to be unreasonable based on cost.

With consideration of the acoustic benefit, construction of Soundwall S776, required to provide noise abatement for a severely impacted receptor, is recommended to be 12-foot-high masonry wall as shown on Figure 10 and Table 1 in Appendix N3.

- **Soundwalls S786 and S790:** Soundwalls S786 and S790, which act as a system, would be located on the ROW line along the northbound on-ramp from Warner Avenue. Part of this soundwall system would replace an existing soundwall along the northbound on-ramp from Warner Avenue, connect to an existing 12-ft-high soundwall at one end, and follows the ROW along the ramp on the other end.

Soundwall S790 would be a 14-ft-high replacement of a portion of an existing 12-ft-high soundwall, and it would connect to the existing 12-ft-high soundwall at its northernmost end. At its southernmost end, Soundwall S790 would connect to Soundwall S786. These

two soundwalls would provide abatement for three single-family residences represented by Receiver R2.81 for Alternative 1. Soundwall S786 would need to be 16 ft in height for Alternative 1. The estimated total construction cost of Soundwall S786 and the incremental cost for Sound wall S790 is \$134,000 for the evaluated heights, which exceeds the maximum reasonable allowance of \$129,000. Figure 10 in the NSR (Amendment 3) shows the heights and lengths of soundwalls S786 and S790 to provide feasible abatement

Because soundwalls S786 and S790 are not reasonable, these soundwalls are not recommended. The existing 12-ft height sound wall along the northbound on-ramp from Warner Avenue will be maintained.

- **Soundwall S795:** Soundwall 795 would be located on the edge of shoulder of southbound I-405 between Warner Avenue and Magnolia Street. This soundwall would provide traffic noise abatement for the Day's Inn Hotel and Boomers represented by Receivers R2.93 through R2.99. Under Alternative 1, an 8-ft-high soundwall would provide feasible abatement to the outdoor use areas of Boomers. For the Day's Inn Hotel, a 12-ft-high soundwall would be required to provide feasible abatement for the first- and second-floor rooms of the hotel. The soundwall would be located within a few feet of the building under Alternative 1; rooms located at the third floor would not receive the 5-dB-minimum required noise reduction with a soundwall as high as 16 ft. The estimated total construction cost of S795 for a 12-ft-high soundwall is \$356,000, which is less than the reasonable allowance of \$2,385,000. Figures 10 and 11 in the NSR (Amendment 3) show the locations and heights of these soundwalls.

With consideration of the acoustic benefit, Soundwall S795 is recommended to be a 12-ft-high masonry wall, as shown in Figures 10 and 11 and Table 1 in Appendix N3.

Magnolia Street to Bolsa Avenue/Goldenwest Street

- **Soundwalls S807 and S811:** Soundwall S811 is an in-kind replacement of an existing 10-ft-high and 285-ft-long soundwall, which would be higher than the portion of wall it would replace. Soundwall S807 would be located at the ROW line and extends the coverage currently provided by an existing soundwall 580 ft southward. The minimum required wall heights for Soundwalls S807 and S811 to meet the feasibility criterion are as shown in Figure 11 in Appendix A1 of the NSR; however, building these soundwalls to a uniform 16-ft height would provide an additional 1-dB of noise reduction for Pleasant View Park behind these walls. The estimated total construction cost of \$258,000 includes additional replacement cost of Soundwall S811 for the increased height and

complete construction of Soundwall S807 at 16 ft high, at a cost that is less than the reasonable allowance of \$333,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S807 and S811 are recommended to be 16-ft-high masonry walls, as shown in Figure 11 and Table 1 in Appendix N3.

- **Soundwall S828:** Soundwall S828 is 2,625 ft long and located at the edge of the shoulder along the northbound side of the I-405 mainline. The southern portion of this wall (S828A) partially replaces an existing 10-ft-high (1,300-ft-long) soundwall with additional height, and the northern portion would be a new soundwall (S828B) providing traffic noise reduction for 28 residences in this area. The minimum required wall heights for Soundwall S828 to meet the feasibility criterion are as shown in Figures 11 and 12 in Appendix A1 of the NSR. The estimated total construction cost of S828A as proposed with a combination of 12- to 16-ft sections would be \$118,000, which is less than the reasonable allowance of \$129,000 for this segment of the wall; therefore, it is recommended. However, the estimated total construction cost of Soundwall S828B as proposed with a combination of 12- to 16-ft sections would be \$557,000, which exceeds the reasonable allowance of \$405,000; therefore, it is not recommended for construction.

With consideration of the acoustic benefit and the incremental cost, Soundwall S828A is recommended to range from a 12- to a 16-ft-high masonry wall, as shown in Figure 11 and Table 1 in Appendix N3.

- **Soundwall S841:** Soundwall S841 would extend the coverage of an existing 12-ft-high soundwall 550 ft to the north along the southbound shoulder of the mainline to compensate for the encroachment of I-405 onto the existing overpass embankment at Newland Street. The minimum required wall heights for Soundwall S841 to meet the feasibility criterion are as shown in Figure 12 in Appendix A1 of the NSR; however, building a uniform 16-ft-high wall would provide an additional 1-dB of noise reduction for residences behind this wall. The estimated total construction cost of \$214,000 for a uniform 16-ft-high wall is less than the reasonable allowance of \$399,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S841 is reasonable and recommended to be a 16-ft-high masonry wall, as shown in Figure 12 and Table 1 in Appendix N3. There are two residences in this area that would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in

place. If Soundwall S841 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required for these residences. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for these residences.

- **Soundwall S857:** Soundwall S857 would be 225 ft long and located at the edge of the shoulder along the southbound I-405 on-ramp at Edinger Avenue. The minimum required wall height for Soundwall S857 to meet the feasibility criterion is as shown in Figure 12 in Appendix A1 of the NSR, and increased wall heights would not provide any additional acoustic benefits. The estimated total construction cost of \$74,000 for this wall is less than the reasonable allowance of \$329,000; therefore, this soundwall is recommended for construction.

With consideration of the acoustic benefit and the incremental cost, Soundwall S857 is reasonable and recommended to be a 12-ft-high masonry wall, as shown in Figure 12 and Table 1 in Appendix N3.

- **Soundwall S868:** Soundwall S868 would be located at the ROW line of the northbound off-ramp to Beach Boulevard. The minimum required wall height for Soundwall S868 to meet the feasibility criterion is as shown in Figure 13 in Appendix A1 of the NSR. The estimated total construction cost of this 16-ft-high wall is \$121,000, which exceeds the reasonable allowance of \$35,000.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S868 is not reasonable; therefore, it is not recommended.

- **Soundwall S896:** Soundwall S896 is located on the I-405 northbound mainline at the ROW line and would extend an existing 14-ft-high soundwall 110 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at McFadden Avenue. Although this wall would not provide 5 dB of noise reduction for residences in the area, it does reduce the exposure of nearby mobile homes to additional traffic noise predicted under Alternative 1; therefore, it is recommended. Figure 14 in Appendix N3 shows the location and height of Soundwall S896.

With consideration of the acoustic benefit and the incremental cost, Soundwall S896 is recommended to be a 10-ft-high masonry wall, as shown in Figure 14 and Table 1 in Appendix N3.

- **Soundwalls S902, S910, and S916:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S902 is an in-kind replacement of an existing 8-ft-high (915-ft-long) wall and would be reconstructed regardless of cost. Soundwall S910 is also an in-kind replacement of a 650-ft-long existing soundwall that would be reconstructed with a higher height. Soundwall S916 is a new wall and, together with Soundwalls S902 and S910, would provide 5 dB of traffic noise protection for five single-family residences in this area. The minimum required wall heights for Soundwalls S910 and S916 to meet the feasibility criterion are as shown in Figure 14 in Appendix A1 of the NSR. Increased wall heights for Soundwall S910 would not provide any additional acoustic benefits; however, constructing Soundwall S916 as a uniform 16-ft-high wall would provide an additional 1-dB of noise reduction for two of the residences behind this wall. The total construction cost of Soundwall S916 and the additional height requirement of Soundwall S910 are estimated at \$262,000, which is less than the reasonable allowance of \$315,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S910 is recommended to be a 10- to 14-ft-high masonry wall, and Soundwall S916 is recommended to be a 16-ft-high masonry wall, as shown in Figure 14 and Table 1 in Appendix N3.

- **Soundwalls S909, S911, and S141:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the southbound side of I-405. Soundwall S141 (1,470 ft long) is an in-kind replacement of one existing 8-ft-high wall at the edge of the shoulder (Sta. 912+34 to 921+50) and a portion of an existing 12-ft-high wall at the ROW line (Sta 920+60 to 926+70). The replacement for the 12-ft-high wall would be at the shoulder of the road, and it would be 8 to 10 ft high because the shoulder elevation is approximately 4 ft higher than the ROW line. Due to the elevation difference, the top of the 8- and 10-ft-high replacement soundwall would be the same as the existing 12-ft-high soundwall. Soundwall S141 would be reconstructed regardless of cost. Soundwall S911 is also an in-kind replacement that would be higher than the existing 8-ft-high (190-ft-long) soundwall. Soundwall S909 (535 ft long) is a new wall and, together with Soundwall S911, would provide 5 dB of traffic noise protection for College Park. The minimum required wall heights for Soundwalls S909 and S911 to meet the feasibility criterion are as shown in Figure 14 in Appendix A1 of the NSR. Increased wall heights would not provide any additional acoustic benefits. The total construction cost of Soundwall S909 and the additional height requirement of Soundwall S911 are estimated

to be \$204,000, which is less than the reasonable allowance of \$270,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S911 is recommended to be a 10- to 14-ft-high masonry wall, and Soundwall S909 is recommended to be a 14-ft-high masonry wall, as shown in Figure 14 and Table 1 in Appendix N3.

- **Soundwall S935:** Soundwall S935 is 335 ft long and located at the ROW line along the southbound I-405 on-ramp from Bolsa Avenue. The minimum required wall heights for Soundwall S935 to meet the feasibility criterion are as shown in Figure 15 in Appendix A1 of the NSR; however, constructing this soundwall to a uniform 14-ft-high wall would provide an additional 1-dB of noise reduction for residences behind this wall. The estimated total construction cost of this 14-ft-high wall, at \$113,000, is less than the reasonable allowance of \$135,000; therefore, Soundwall S935 is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S935 is recommended to be a 14-ft-high masonry wall, as shown in Figure 15 and Table 1 in Appendix N3.

Bolsa Avenue/Goldenwest Street to SR-22/Valley View Street, SR-22 East to Springdale Street

- **Soundwalls S182, S972, and S978:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S182 is an in-kind replacement of an existing 10-ft-high (1,810-ft-long) wall that would be reconstructed regardless of cost. Soundwall S972 is also an in-kind replacement of the existing 10-ft-high (310-ft-long) soundwall with higher height. Soundwall S978 is a new 600-ft-long wall and, together with Soundwalls S972 and S182, would provide 5-dB of traffic noise protection for the frontage units of Buckingham Park and Westminster High School. The minimum required wall heights for Soundwalls S972 and S978 to meet the feasibility criterion are as shown in Figures 16 and 17 in Appendix A1 of the NSR. The estimated total construction cost of these walls as proposed with a combination of 12- to 14-ft-high sections would be \$350,000, which exceeds the maximum reasonable allowance of \$333,000 by \$17,000; therefore, these two soundwalls would not be reasonable for providing abatement for both the school and park. As a result, Soundwall S972 would be a 10-ft-high in-kind replacement of the existing 10-ft-high wall and would be reconstructed regardless of cost.

A 12-ft-high and shorter Soundwall S978 (600 ft long) would provide 5 dB of noise reduction for Buckingham Park. The reasonableness allowance for the shorter wall is

\$222,000, and the construction cost is \$189,000, which means that the shorter Soundwall S978 is reasonable. Extending Soundwall S978 at 12 ft to connect to Soundwall S972 would not provide the minimum required 5-dB noise reduction at the school.

With consideration of the acoustic benefit and the incremental cost, Soundwall S978 is recommended to be a 12-ft-high masonry wall, as shown in Figures 16 and 17 and Table 1 in Appendix N3.

- **Soundwall S995:** Soundwall S995 would be located at the ROW line along the southbound side of I-405 and would replace 200 ft of an existing soundwall at the same location with new height. Figure 17 in Appendix A1 of the NSR shows the minimum heights and length of Soundwall S995 to provide feasible abatement. The estimated total construction cost of this soundwall is \$76,000, which exceeds the reasonable allowance of \$70,000; therefore, construction of this wall is not recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S995 is not reasonable; therefore, it is not recommended.

- **Soundwall S998:** Soundwall S998 would be located at the ROW line along the northbound side of I-405 and would extend an existing soundwall 140 ft to the north. Figure 17 in Appendix N3 shows the height and length of Soundwall S998 to provide feasible abatement. The estimated total construction cost of this wall is \$53,000, which is less than the reasonable allowance of \$90,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S998 is recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 1 in Appendix N3.

- **Soundwall S1006:** Soundwall S1006 would be 330 ft long and located at the ROW line along the northbound off-ramp to Westminster Avenue. The minimum required wall height for Soundwall S1006 to meet the feasibility criterion is 10 ft high, as shown in Figure 17 in Appendix A1 of the NSR; however, building a 16-ft-high soundwall would provide an additional 4 dB of noise reduction for the exterior and interior areas of Motel 6 behind this wall. The estimated total construction cost of this 16-ft-high wall is \$123,000, which is less than the maximum reasonable allowance of \$371,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1006 is reasonable; therefore, it is recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 1 in Appendix N3. The outdoor pool area and the interior rooms of Motel 6 would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S1006 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required at this location. If building a soundwall is not reasonable due to other factors besides cost, then building other types of abatement must be considered for the pool area and interior rooms facing the freeway; however, the owner of the motel may decline construction of the soundwall because it would block their visibility from the freeway.

- **Soundwall S1009:** Soundwall S1009 would be 857 ft long and located at the ROW line along the southbound on-ramp from Westminster Avenue, providing traffic noise reduction for the six frontage units of Cascade Park and five residences in this area. The minimum required wall heights for this soundwall to meet the feasibility criterion are as shown in Figures 17 and 18 in Appendix A1 of the NSR; however, building a 16-ft-high soundwall would provide an additional 1-dB of noise reduction for frontage units of the park. The estimated total construction cost of this soundwall is \$316,000, which is less than the reasonable allowance of \$561,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1009 is recommended to be a 16-ft-high masonry wall, as shown in Figures 17 and 18 and Table 1 in Appendix N3.

- **Soundwalls S1016, S1020, and S1024:** Soundwalls S1016 and S1020 would be located at the edge of the shoulder along the northbound on-ramp from Westminster Avenue, and Soundwall S1024 would be located within the ROW. Soundwall S1020 (550 ft long) would be an in-kind replacement of an existing soundwall with a new height. The purpose of Soundwall S1024 is to extend the coverage of replacement Soundwall S1020 to compensate for the encroachment of I-405 onto the existing overpass embankment that would occur under Alternative 1. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A1 of the NSR; however, building the new Soundwall S1016 as a uniform 16-ft-high soundwall would provide an additional 1-dB of noise reduction for the school playground area. The total construction cost of Soundwalls S1016 and S1024, including the additional height requirement of Soundwall S1020, is estimated to be \$308,000, which is less than the reasonable allowance of \$376,000; therefore, all three soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S1016, S1020, and S1024 are recommended to be 16-ft-high masonry walls, as shown in Figure 18 and Table 1 in Appendix N3.

- **Soundwalls S1026 and S1028:** Soundwalls S1026 and S1028 would be located at the ROW line along the northbound I-405 mainline. Soundwall S1028 replaces and heightens 75 ft of an existing soundwall at its current location. Soundwall S1026 extends the coverage of Soundwall S1028 farther south to compensate for the encroachment of I-405 on to the overpass embankment that would occur under Alternative 1. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A1 of the NSR. The total construction cost of Soundwalls S1026 and S1028 is estimated to be \$91,000, which exceeds the reasonable allowance of \$45,000; however, building Soundwall S1026 at 14 ft high reduces the exposure of four single-family residences to additional traffic noise predicted under Alternative 1 due to encroachment of I-405 onto the overpass embankment at Springdale Street; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1028 is not recommended and Soundwall S1026 is recommended to be a 14-ft-high masonry wall, as shown in Figure 18 and Table 1 in Appendix N3.

- **Soundwalls S1079 and S1083:** Soundwalls S1079 and S1083 would be located at the ROW line along the southbound I-405 mainline. Soundwall S1079 replaces and heightens 130 ft of an existing soundwall at its current location. Soundwall S1083 extends the coverage of Soundwall S1079 farther north along Valley View Street. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 20 in Appendix A1 of the NSR; however, building Soundwall S1083 as a uniform 14-ft-high soundwall would provide an additional 2 dB of noise reduction for the residences in this area. The total construction cost of Soundwalls S1083 and S1079 is estimated at \$190,000, which is less than the reasonable allowance of \$245,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S1079 and S1083 are recommended to be 14-ft-high masonry walls, as shown in Figure 20 and Table 1 in Appendix N3.

Valley View Street to Seal Beach Boulevard

- **Soundwall S1162:** Soundwall S1162 would be located at the edge of the shoulder along the northbound side of I-405 and would extend an existing soundwall 700 ft to the north. The total construction cost of this wall is estimated to be \$225,000, which exceeds the reasonable allowance of \$129,000. Figure 23 in Amendment 1 of the NSR shows the height and length of Soundwall S1162 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1162 is not reasonable; therefore, it is not recommended. However, this area is already partially protected by a 7- to 8-ft-high private wall on top of a berm.

Seal Beach Boulevard to I-605

- **Soundwall S1226:** Soundwall S1226 is to extend the coverage of the existing soundwall 440 ft north to compensate for the encroachment of I-405 onto the existing northbound I-405 to westbound SR-22 embankment that would occur under Alternative 1. The estimated total construction cost of this wall is \$163,000, which is less than the reasonable allowance of \$188,000; therefore, this soundwall is recommended. Figure 25 in Appendix N3 shows the height and length of Soundwall S1226 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1226 is recommended to be a 16-ft-high masonry wall, as shown in Figure 25 and Table 1 in Appendix N3.

Residual Effects after Abatement:

Due to the proposed soundwalls or the replacement of existing soundwalls with additional heights, the receptors on the opposite side of the walls may experience slightly more traffic noise.

Alternative 2

The traffic noise analysis indicates that residential areas and park and recreation facilities, as well as six schools and a motel, would be impacted by this alternative (i.e., the noise level would approach or exceed the NAC). Without any additional barrier protection, noise analysis results indicate that the proposed project would raise noise levels in some areas from 3 to 7 dB compared to the Design Year (2040) No Build Alternative. While all of the alternatives would result in adverse noise impacts, from a numerical perspective Alternative 2 would exceed the NAC at more frequent outdoor use locations than Alternative 1 and fewer locations than

Alternative 3. Impacts to other Category B types would be comparable between the build alternatives. The proposed project would not cause a substantial noise increase (i.e., 12 dB).

The preliminary noise abatement decision for each acoustically feasible soundwall identified within the NSR for Alternative 2 is provided below. As such, the physical characteristics of noise abatement described herein also may be subject to change. If pertinent parameters change substantially during the final project design, the preliminary noise abatement decision may be changed to include abatement in the final project design. A final decision on whether and how to construct noise abatement would be made upon completion of the project design. The locations and heights of the recommended soundwalls are summarized in Table 2 and shown in the figures in Appendix N (Sections N2 & N4).

Euclid Street to Magnolia Street

- **Soundwalls S708, S710, and S718:** These soundwalls, which act as a system, would be located along the northbound I-405 edge of the shoulder and ROW line. Soundwall S710 is an in-kind replacement of an existing 375-ft-long soundwall and would be reconstructed regardless of cost. Soundwall S708 is 240 ft long and extends the coverage of Soundwall S710 to compensate for the widening of the embankment at Talbert Avenue. Soundwall S718 is 1,760 ft long and extends the Soundwall S710 protection north along the off-ramp to Brookhurst Avenue. The minimum required wall height for Soundwall S708 to meet the feasibility criterion is 12 ft, as shown in Figure 8 in Appendix A2 of the NSR, and increasing the height of this wall would not provide any additional acoustic benefits; however, constructing Soundwall S718 as a uniform 16-ft-high wall would provide an additional 1 to 2 dB of noise reduction for residences behind this wall. The estimated total construction cost of Soundwalls S708 at 12 ft high and S718 at 16 ft high would be \$721,000, which is less than the reasonable allowance of \$1,080,000.

With consideration of the acoustic benefit and the incremental cost, Soundwall S708 is recommended to be a 12-ft-high masonry wall, and Soundwall S718 is recommended to be a 16-ft-high masonry wall, as shown in Figures 7 and 8 and Table 2 in Appendix N4.

- **Soundwall S733:** Soundwall S733 would be located at the shoulder of the southbound off-ramp to Brookhurst Street. Figure 8 in Appendix A2 of the NSR shows the minimum height and length of Soundwall S733 to provide feasible abatement. The estimated total construction cost of this soundwall at \$107,000 exceeds the reasonable allowance of \$43,000.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S733 is not reasonable; therefore, it is not recommended.

- **Soundwall S745:** Soundwall S745 would extend an existing property wall 750 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment. The southern portion of this wall (S745A) replaces the 10-ft-high (430-ft-long) portion of an existing property wall with a 12- to 14-ft soundwall, and the northern portion would be a new soundwall (S745B) providing traffic noise reduction for Valley Vista High School. The minimum required wall heights for Soundwall S745 to meet the feasibility criterion are as shown in Figure 9 in Appendix A2 of the NSR. The estimated total construction cost of Soundwall S745A as proposed, with a combination of 12- to 14-ft sections, would be \$137,000, which exceeds the reasonable allowance of \$98,000 for this segment of the wall; therefore, it is not recommended. The existing 10-ft-high property wall provides some level of noise protection for these residences. The estimated total construction cost of Soundwall S745B, as proposed, at 14 ft high would be \$107,000, which exceeds the reasonable allowance of \$98,000; however, because the reconfigured embankment of Slater Avenue would expose the nearby high school to increased traffic noise, construction of this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S745A is not reasonable; therefore, it is not recommended, and Soundwall S745B is recommended to be a 14-ft-high masonry wall, as shown in Figure 9 and Table 2 in Appendix N4.

- **Soundwall S746:** Soundwall S746 would extend an existing soundwall 195 ft to the south to compensate for the encroachment of I-405 onto the existing overpass embankment and provides 5 dB of protection for a single-family residence, as well as a preschool playground. Figure 9 in Appendix A2 of the NSR shows the height and length of Soundwall S746 to provide feasible abatement; however, constructing Soundwall S746 as a uniform 14-ft-high wall provides an additional 1-dB of noise reduction for residences behind this wall. The estimated total construction cost of Soundwall S746 at 14 ft high is \$66,000, which is less than the reasonable allowance of \$102,000.

With consideration of the acoustic benefit and the incremental cost, Soundwall S746 is recommended to be a 14-ft-high masonry wall, as shown in Figure 9 and Table 2 in Appendix N4. The playground area of the preschool would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S746 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required for this location. If building a

soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for potential noise impacts in the interior of the land use.

- **Soundwall S765:** Soundwall S765 would extend an existing 16-ft-high soundwall 215 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of four single-family residences to additional traffic noise predicted under Alternative 2; therefore, it is recommended. Figure 9 and Table 2 in Appendix N4 show the location and height of Soundwall S765.

With consideration of the acoustic benefit and the incremental cost, Soundwall S765 is recommended to range from a 14- to 16-ft-high masonry wall, as shown in Figure 9 in Appendix N4.

- **Soundwall S766:** Soundwall S766 would extend an existing 14-ft-high soundwall 145 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of six single-family residences to additional traffic noise predicted under Alternative 2; therefore, it is recommended. Figure 9 and Table 2 in Appendix N4 show the location and height of Soundwall S766.

With consideration of the acoustic benefit and the incremental cost, Soundwall S766 is recommended to be a 14-ft-high masonry wall, as shown in Figure 9 in Appendix N4.

- **Soundwall S776:** For Alternative 2, Soundwall S776 would be 251 feet long and located at the edge of the shoulder of the northbound off-ramp to Warner Avenue. The estimated total construction cost of this 12-ft-high wall is \$82,000, which exceeds the reasonable allowance of \$41,000. This soundwall was initially found not reasonable due to cost; however, El Dorado Preschool opened during preparation of the NSR, Amendment 3, and it was found that the predicted peak-hour noise level at the playground would be 75 dBA without a soundwall, which is considered a severe impact. Where severe impacts are identified, unusual and extraordinary abatement must be considered, even if the noise abatement is determined to be unreasonable based on cost.

With consideration of the acoustic benefit, construction of Soundwall S776, required to provide noise abatement for a severely impacted receptor, is recommended to be 12-foot-high masonry wall as shown on Figure 10 and Table 2 in Appendix N4.

- **Soundwalls S786 and S790:** Soundwalls S786 and S790, which act as a system, would be located on the ROW line along the northbound on-ramp from Warner Avenue. Part of this soundwall system would replace an existing soundwall along the northbound on-ramp from Warner Avenue, connect to an existing 12-ft-high soundwall at one end, and follows the ROW along the ramp on the other end.

Soundwall S790 would be a 14-ft-high replacement of a portion of an existing 12-ft-high soundwall, and it would connect to the existing 12-ft-high soundwall at its northernmost end. At its southernmost end, Soundwall S790 would connect to Soundwall S786. These two soundwalls would provide abatement for three single-family residences represented by Receiver R2.81 for Alternative 2. Soundwall S786 would need to be 14 ft in height for Alternative 2. The estimated total construction cost of this 14-ft-high wall is \$124,000, which is less than the reasonable allowance of \$135,000. Increased wall height would not provide any additional benefited residences.

With consideration of the acoustic benefit, Soundwall S790 is an in-kind replacement and recommended to be a 14-ft-high masonry wall to connect to an existing 12-ft-high soundwall. Soundwall S786 is recommended as a 14-ft-high soundwall to connect to Soundwall S790, as shown in Figure 10 and Table 2 in Appendix N4.

- **Soundwall S795:** Soundwall 795 would be located on the edge of shoulder of southbound I-405 between Warner Avenue and Magnolia Street. This soundwall would provide traffic noise abatement for the Day's Inn Hotel and Boomers represented by Receivers R2.93 through R2.99. Under Alternative 2, an 8-ft-high soundwall would provide feasible abatement to the outdoor use areas of Boomers. For the Day's Inn Hotel, a 12-ft-high soundwall would be required to provide feasible abatement for the first- and second-floor rooms of the hotel. The soundwall would be located within a few feet of the building under Alternative 2; rooms located at the third floor would not receive the 5-dB-minimum required noise reduction with a soundwall as high as 16 ft. The estimated total construction cost of S795 for a 12-ft-high soundwall is \$356,000, which is less than the reasonable allowance of \$2,385,000.

With consideration of the acoustic benefit, Soundwall S795 is recommended to be a 12-ft-high masonry wall, as shown in Figures 10 and 11 and Table 2 in Appendix N4.

Magnolia Street to Bolsa Avenue/Goldenwest Street

- **Soundwalls S807, S811, and S827:** Soundwall S827 is an in-kind replacement of an existing 10- to 12-ft-high (2,390-ft-long) soundwall in this area that would be required regardless of cost. Soundwall S811 is also an in-kind replacement of an existing 10-ft-high (480-ft-long) soundwall that would be higher for a 300-ft-long portion of the existing wall it would replace. Soundwall S807 would be located at the ROW line and extend the coverage currently provided by the existing soundwall 575 ft southward. The minimum required wall heights for Soundwalls S807 and S811 to meet the feasibility criterion are as shown in Figure 11 in Appendix A2 of the NSR; however, constructing Soundwall S807 to a uniform 14-ft-high wall would provide an additional 1-dB of noise reduction for Pleasant View Park behind this wall. The estimated total construction cost of \$239,000 includes additional replacement cost of Soundwall S811 for the increased height and complete construction of Soundwall S807 at 14 ft high; the estimated cost is less than the maximum reasonable allowance of \$273,000; therefore, these walls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S811 is recommended to range from a 10- to a 16-ft-high masonry wall and Soundwall S807 to be a uniform 14-ft-high masonry wall, as shown in Figure 11 and Table 2 in Appendix N4 of this report.

- **Soundwall S834:** Soundwall S834, which is located at the edge of the shoulder along the northbound side of I-405 mainline, would provide 5 dB of traffic noise reduction for six single-family residences. The estimated total construction cost of this soundwall is \$523,000, which exceeds the maximum reasonable allowance of \$270,000; therefore, this soundwall is not recommended. Figure 12 in Appendix A2 of the NSR show the heights and length of Soundwall S834 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S834 is not reasonable; therefore, it is not recommended.

- **Soundwall S841:** Soundwall S841 would extend the coverage of an existing 12-ft-high soundwall 525 ft to the north along the southbound shoulder of the mainline to compensate for the encroachment of I-405 onto the existing overpass embankment at Newland Street. The minimum required wall heights for Soundwall S841 to meet the feasibility criterion are as shown in Figure 12 in Appendix A2 of the NSR; however, constructing a uniform 16-ft-high wall would provide an additional 1-dB of noise

reduction for residences behind this wall. The estimated total construction cost of \$205,000 for a uniform 16-ft-high wall is less than the reasonable allowance of \$385,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S841 is reasonable and recommended to be a 16-ft-high masonry wall, as shown in Figure 12 and Table 2 in Appendix N4. There are two residences in this area that would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S841 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required for these residences. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement, such as berms, must be considered for these residences.

- **Soundwall S857:** Soundwall S857 would be 225 ft long and located at the edge of the shoulder along the southbound I-405 on-ramp at Edinger Avenue. The minimum required wall height for Soundwall S857 to meet the feasibility criterion is as shown in Figure 12 in Appendix A2 of the NSR; however, constructing Soundwall S857 to a uniform 14-ft-height would provide an additional 1-dB of noise reduction for the residences behind this wall. The estimated total construction cost of \$82,000 for a uniform 14-ft-high wall is less than the reasonable allowance of \$343,000; therefore, this soundwall is recommended for construction.

With consideration of the acoustic benefit and the incremental cost, Soundwall S857 is reasonable and recommended to be a 14-ft-high masonry wall, as shown in Figure 12 and Table 2 in Appendix N4.

- **Soundwall S868:** Soundwall S868 would be located at the ROW line of the northbound off-ramp to Beach Boulevard. The estimated total construction cost of this 16-ft-high wall is \$121,000, which exceeds the reasonable allowance of \$35,000. Figure 13 in Appendix A2 of the NSR shows the minimum height and length of Soundwall S868 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S868 is not reasonable; therefore, it is not recommended.

- **Soundwall S896:** Soundwall S896 is located on the I-405 northbound mainline at the ROW and would extend an existing 14-ft-high soundwall 110 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at

McFadden Avenue. This soundwall reduces the exposure of nearby mobile homes to additional traffic noise predicted under Alternative 2 due to embankment modification; therefore, it is recommended. Figure 14 in Appendix N4 shows the location and height of Soundwall S896.

With consideration of the acoustic benefit and the incremental cost, Soundwall S896 is recommended to be a 10-ft-high masonry wall, as shown in Figure 14 and Table 2 in Appendix N4.

- Soundwalls S900, S908, and S916:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S900 is an in-kind replacement of an existing 8-ft-high (710-ft-long) wall and would be reconstructed regardless of cost. Soundwall S908 is also an in-kind replacement that would be higher than the existing 850-ft-long soundwall. Soundwall S916 is a new wall and, together with Soundwalls S900 and S908, would provide 5 dB of traffic noise protection for seven single-family residences in this area. The minimum required wall heights for Soundwalls S908 and S916 to meet the feasibility criterion are as shown in Figure 14 in Appendix A2 of the NSR. The total construction cost of Soundwall S916 and the additional height requirement of Soundwall S908 are estimated to be \$361,000, which exceeds the reasonable allowance of \$315,000; therefore, these soundwalls are not recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S908 is recommended to be an in-kind replacement of an existing 8-ft-high masonry wall, as shown in Figure 14 and Table 2 in Appendix N4. Soundwall S916 is not reasonable and is not recommended.

- Soundwalls S907 and S141:** These soundwalls would be located at the edge of the shoulder along the southbound side of I-405. Soundwall S141 is an in-kind replacement of an existing 8-ft-high (1,525-ft-long) soundwall on the shoulder of the road and a portion of a 12-ft-high soundwall on the ROW line. The replacement for the 12-ft-high wall would be at the shoulder of the road, and it would be 8 ft high because shoulder elevation is approximately 4 ft higher than the ROW line. Due to the elevation difference, the top of the wall of the 8-ft-high replacement soundwall would be the same as the existing 12-ft-high soundwall. Soundwall S141 would be reconstructed regardless of cost. Soundwall S907 is a new wall and provides 5 dB of traffic noise protection for College Park. The minimum required wall height for Soundwall S907 to meet the feasibility criterion is shown in Figure 14 in Appendix A2 of the NSR; however, constructing

Soundwall S907 to a uniform 14-ft height would provide an additional 1-dB of noise reduction for the park behind this wall. The estimated total construction cost of Soundwall S907 at a height of 14 ft is \$232,000, which is less than the reasonable allowance of \$270,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S907 is recommended to be a 14-ft-high masonry wall, as shown in Figure 14 and Table 2 in Appendix N4. Increased wall height would not provide any additional acoustic benefits.

- **Soundwall S935:** Soundwall S935 is 395 ft long and located at the ROW line along the southbound I-405 on-ramp from Bolsa Avenue. The minimum required wall heights for Soundwall S935 to meet the feasibility criterion are as shown in Figure 15 in Appendix A2 of the NSR, providing 5 dB of traffic noise protection for one of the residences behind this wall; however, constructing Soundwall S935 as a uniform 16-ft-high wall would provide 5 dB of noise reduction for four of the residences in this area. The estimated total construction cost of this wall, as proposed, is \$147,000, which is less than the maximum reasonable allowance of \$180,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S935 is recommended to be a 16-ft-high masonry wall, as shown in Figure 15 and Table 2 in Appendix N4.

Bolsa Avenue/Goldenwest Street to SR-22/Valley View Street, SR-22 East to Springdale Street

- **Soundwalls S182, S972, and S978:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S182 is an in-kind replacement of an existing 10-ft-high (1,710-ft-long) wall and would be reconstructed regardless of cost. Soundwall S972 is also an in-kind replacement that would be higher than the existing 310-ft-long soundwall. Soundwall S978 is a new 990-ft-long wall and, together with Soundwalls S972 and S182, would provide 5 dB of traffic noise protection for the frontage units of Buckingham Park and Westminster High School, as well as two single-family residences in this area. The minimum required wall heights for Soundwalls S972 and S978 to meet the feasibility criterion are as shown in Figures 16 and 17 in Appendix A2 of the NSR; however, constructing Soundwall S978 to a uniform 16-ft height would provide an additional 1-dB of noise reduction for the park and school behind this wall. The total construction cost of Soundwall S978 at 16 ft high and the additional height requirement of Soundwall S972 are estimated to be \$416,000,

which is less than the reasonable allowance of \$507,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S972 is recommended to be between a 12- and a 16-ft-high masonry wall and Soundwall S978 is recommended to be a uniform 16-ft-high masonry wall, as shown in Figures 16 and 17 and Table 2 in Appendix N4.

- **Soundwall S995:** Soundwall S995 would be 200 ft long and located at the ROW line along the southbound side of I-405, replacing an existing soundwall at the same location with new height. The minimum heights and length of Soundwall S995 to provide feasible abatement are as shown in Figure 17 in Appendix A2 of the NSR. The estimated total construction cost of this soundwall is \$81,000, which exceeds the reasonable allowance of \$74,000; because there is an existing soundwall at this location, construction of this wall is not recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S995 is not reasonable; therefore, it is not recommended.

- **Soundwall S998:** Soundwall S998 would be located at the ROW line along the northbound side of I-405 and would extend an existing soundwall 140 ft to the north. The minimum heights and length of Soundwall S998 to provide feasible abatement are as shown in Figure 17 in Appendix A2 of the NSR; however, increasing the wall height to 16 ft would provide an additional 2 dB of noise protection for the residences behind this wall. The estimated total construction cost of this wall at \$48,000 is less than the reasonable allowance of \$94,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S998 is reasonable; therefore, it is recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 2 in Appendix N4.

- **Soundwall S1006:** Soundwall S1006 would be 330 ft long and located at the ROW line along the northbound off-ramp to Westminster Avenue. The minimum required wall height for Soundwall S1006 to meet the feasibility criterion is 10 ft high, as shown in Figure 17 in Appendix A2 of the NSR; however, constructing a 16-ft-high soundwall would provide an additional 3 dB of noise reduction for the exterior and interior areas of Motel 6 behind this wall. The estimated total construction cost of this 16-ft-high wall is

\$123,000, which is less than the maximum reasonable allowance of \$385,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1006 is reasonable and recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 2 in Appendix N4. The outdoor pool area and the interior rooms of Motel 6 would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S1006 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required at this location. If building a soundwall is not reasonable due to other factors besides cost, then building other types of abatement must be considered for the pool area and interior rooms facing the freeway; however, the owner of the motel may decline construction of the soundwall because it would block their visibility from the freeway.

- **Soundwalls S1005 and S1009:** Soundwall S1005 would replace and heighten an existing soundwall (175 ft long) at its current location, and Soundwall S1009 would be 850 ft long and extends the coverage of Soundwall S1005 to the north along the southbound on-ramp from Westminster Avenue, providing traffic noise reduction for Cascade Park and residences in this area. The minimum required wall heights for these soundwalls to meet the feasibility criterion are as shown in Figures 17 and 18 in Appendix A2 of the NSR; however, constructing Soundwall S1009 to a height of 16 ft would provide an additional 1 to 2 dB of noise reduction for the park behind this wall. The total construction cost of Soundwall S1009 and the additional height requirement of Soundwall S1005 are estimated at \$320,000, which is less than the reasonable allowance of \$583,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1005 is recommended to be a 12-ft-high masonry wall, and Soundwall S1009 is recommended to be a 16-ft-high masonry wall, as shown in Figures 17 and 18 and Table 2 in Appendix N4. The park area and residences behind these walls would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without soundwalls in place. If Soundwalls S1005 and S1009 are determined to be unreasonable based on cost during the project design phase, providing the soundwalls would still be required for these locations. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for potential noise impacts in the interior of land use.

- **Soundwalls S1016, S1020, S1022, and S1024:** Soundwalls S1016 and S1020 would be located at the edge of the shoulder along the northbound on-ramp from Westminster

Avenue, and Soundwall S1022 and S1024 would be located within the ROW. Soundwalls S1020 (325 ft long) and S1022 (200 ft long) would be in-kind replacement soundwalls with a new height. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A2 of the NSR; however, constructing Soundwall S1016 as a uniform 16-ft-high soundwall would provide an additional 1-dB of noise reduction for the school playground area. The total construction cost of Soundwalls S1016 and S1024, including the additional height requirement of Soundwalls S1020 and S1022, is estimated to be \$349,000, which is less than the reasonable allowance of \$376,000; therefore, all four soundwalls are recommended. Building Soundwall S1024 would also compensate for the encroachment of I-405 onto the existing overpass embankment at Springdale Street.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S1016, S1020, S1022, and S1024 are recommended to be 16-ft-high masonry walls, as shown in Figure 18 and Table 2 in Appendix N4.

- **Soundwalls S1026 and S1028:** Soundwalls S1026 and S1028 would be located at the ROW line along the northbound I-405 mainline. Soundwall S1028 replaces and heightens a 200-ft portion of an existing soundwall at its current location, and Soundwall S1026 extends the coverage of Soundwall S1028 farther south. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A2 of the NSR. The total construction cost of Soundwalls S1026 and S1028 is estimated to be \$144,000, which exceeds the reasonable allowance of \$45,000; however, building Soundwall S1026 at 14 ft high reduces the exposure of four single-family residences to additional traffic noise predicted under Alternative 2 due to encroachment of I-405 on to the existing embankment at Springdale Street; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1028 is not recommended and Soundwall S1026 is recommended to be a 14-ft-high masonry wall, as shown in Figure 18 and Table 2 in Appendix N4.

- **Soundwall S1083:** Soundwall S1083 would be located at the ROW line along the southbound I-405 mainline along Valley View Street. The minimum required heights for this soundwall to meet the feasibility criterion are as shown in Figure 20 in Appendix A2 of the NSR; however, constructing Soundwall S1083 as a 14- to 16-ft-high wall would provide an additional 1-dB of noise reduction for the residences behind this wall. The total construction cost of Soundwall S1083 is estimated to be \$196,000, which is less

than the maximum reasonable allowance of \$255,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1083 is recommended to be a 14- to 16-ft-high masonry wall, as shown in Figure 20 and Table 2 in Appendix N4.

Valley View Street to Seal Beach Boulevard

- **Soundwall S1162:** Soundwall S1162 would be located at the edge of the shoulder along the northbound side of I-405 and would extend an existing soundwall 700 ft to the north. The total construction cost of this wall is estimated to be from \$225,000, which exceeds the reasonable allowance of \$129,000. Figure 23 in Amendment 1 of the NSR shows the height and length of Soundwall S1162 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1162 is not reasonable and therefore not recommended; however, this area is already partially protected by a 7 to 8-ft-high private wall on top of a berm.

Seal Beach Boulevard to I-605

- **Soundwall S1226:** The purpose of Soundwall S1226 is to extend the coverage of an existing soundwall 440 ft north to compensate for the encroachment of I-405 onto the existing northbound I-405 to westbound SR-22 embankment that would occur under Alternative 2. The estimated total construction cost of this wall is \$163,000, which exceeds the maximum reasonable allowance of \$141,000; however, this soundwall reduces the exposure of nine single-family residences to additional traffic noise predicted under Alternative 2 due to embankment modification; therefore, it is recommended. Figure 25 in Appendix N4 shows the height and length of Soundwall S1226 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1226 is recommended to be a 16-ft-high masonry wall, as shown in Figure 25 and Table 2 in Appendix N4.

Residual Effects after Abatement:

Due to the proposed soundwalls or the replacement of existing soundwalls with additional heights, the receptors on the opposite side of the walls may experience slightly more traffic noise.

Alternative 3 (Preferred Alternative)

The traffic noise analysis indicates that residential areas and park and recreation facilities, as well as six schools and a motel, would be impacted by this alternative (i.e., the noise level would approach or exceed the NAC). Without any additional barrier protection, noise analysis results indicate that the proposed project would raise noise levels in some areas from 3 to 7 dBA compared to the Design Year (2040) No Build Alternative. While all of the alternatives would result in adverse noise impacts, from a numerical perspective Alternative 3 is the longest; therefore, it would exceed the NAC at more frequent outdoor use locations than Alternatives 1 and 2. Overall, impacts to other Category B types would be comparable between the build alternatives. The proposed project would not cause a substantial noise increase (i.e., 12 dB).

The preliminary noise abatement decision for each acoustically feasible soundwall identified within the NSR for Alternative 3 is provided below. As such, the physical characteristics of noise abatement described herein also may be subject to change. If pertinent parameters change substantially during the final project design, the preliminary noise abatement decision may be changed to include abatement in the final project design. A final decision on whether and how to construct noise abatement would be made upon completion of the project design. The locations and heights of the recommended soundwalls are summarized in Table 3 and shown in the figures in Appendix N (Sections N1 and N5).

South of Bristol Street to Euclid Street

- **Soundwall S614A:** Soundwall S614A would be located at the shoulder of the northbound on-ramp from Harbor Boulevard. The estimated total construction cost of this 200-ft-long wall is \$66,000, which exceeds the reasonable allowance of \$39,000. Figure 4 in Appendix A3 of the NSR shows the minimum height and length of Soundwall S614A to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S614A is not reasonable; therefore, it is not recommended.

- **Soundwall S614B (Option):** Soundwall S614B would be located on private property along the northbound side of I-405. This 64-ft-long soundwall is an option to Soundwall S614A. The minimum required wall height for Soundwall S614B to meet the feasibility criterion is 8 ft, as shown in Figure 4 in Appendix A3 of the NSR. The estimated total construction cost of an 8-ft-high wall, including TCE and temporary access, is estimated at \$61,000 (\$45,000 in easement and \$16,000 in construction cost), which is more than the reasonable allowance of \$37,000; therefore, this soundwall is not recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S614B is not reasonable; therefore, it is not recommended.

Euclid Street to Magnolia Street

- **Soundwalls S708, S710, and S718:** These soundwalls, which act as a system, would be located along the northbound I-405 edge of the shoulder and ROW line. Soundwall S710 is an in-kind replacement of an existing 375-ft-long soundwall and would be reconstructed regardless of cost. Soundwall S708 is 240 ft long and extends the coverage of Soundwall S710 to compensate for the widening of the embankment at Talbert Avenue. Soundwall S718 is 1,405 ft long and extends the Soundwall S710 protection north along the off-ramp to Brookhurst Avenue. The minimum required wall height for Soundwall S708 to meet the feasibility criterion is 12 ft, as shown in Figures 7 and 8 in Appendix A3 of the NSR, and increasing the height of this wall would not provide any additional acoustic benefits; however, constructing Soundwall S718 as a uniform 16-ft-high wall would provide an additional 1 to 2 dB of noise reduction for residences behind this wall. The estimated total construction cost of Soundwalls S708 at 12 ft high and S718 at 16 ft high would be \$584,000, which is less than the reasonable allowance of \$945,000.

With consideration of the acoustic benefit and the incremental cost, Soundwall S708 is recommended to be a 12-ft-high masonry wall, and Soundwall S718 is recommended to be a 16-ft-high masonry wall, as shown in Figures 7 and 8 and Table 3 in Appendix N5.

- **Soundwall S733:** Soundwall S733 would be located at the shoulder of the southbound off-ramp to Brookhurst Street. Figure 8 in Appendix A3 of the NSR shows the minimum height and length of Soundwall S733 to provide feasible abatement. The estimated total construction cost of this wall is \$107,000, which exceeds the reasonable allowance of \$43,000.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S733 is not reasonable; therefore, it is not recommended.

- **Soundwall S745:** Soundwall S745 would extend an existing property wall 750 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment. The southern portion of this wall (S745A) replaces the 10-ft-high (430-ft-long) portion of an existing property wall with a 14- to 16-ft soundwall, and the northern portion would be a new soundwall (S745B) providing traffic noise reduction for Valley

Vista High School. The minimum required wall heights for Soundwall S745 to meet the feasibility criterion are as shown in Figure 9 in Appendix A3 of the NSR. The estimated total construction cost of Soundwall S745A, as proposed with a combination of 14- to 16-ft sections, would be \$150,000, which exceeds the reasonable allowance of \$98,000 for this segment of the wall; therefore, it is not recommended. The existing 10-ft-high property wall provides some level of noise protection for these residences. The estimated total construction cost of Soundwall S745B, as proposed at 16 ft high, would be \$119,000, which exceeds the reasonable allowance of \$98,000; however, because the reconfigured embankment of Slater Avenue would expose the nearby high school to increased traffic noise, construction of this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S745A is not reasonable and therefore not recommended, and Soundwall S745B is recommended to be a 16-ft-high masonry wall, as shown in Figure 9 and Table 3 in Appendix N5.

- **Soundwall S746:** Soundwall S746 would extend an existing soundwall 195 ft to the south to compensate for the encroachment of I-405 onto the existing overpass embankment and provides 5 dB of protection for a single-family residence, as well as 7 dB of protection for a preschool playground. The estimated total construction cost of Soundwall S746 is \$59,000, which is less than the reasonable allowance of \$102,000. Increased wall height would not provide any additional benefited residences. Figure 9 in Appendix N5 shows the height and length of Soundwall S746 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, Soundwall S746 is recommended to be a 12-ft-high masonry wall, as shown in Figure 9 and Table 3 in Appendix N5. The playground area of the preschool in this area would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S746 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required for this location. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for potential noise impacts in the interior of the land use.

- **Soundwall S765:** Soundwall S765 would extend an existing 16-ft-high soundwall 215 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of four single-family residences to additional traffic noise predicted under Alternative 3;

therefore, it is recommended. Figure 9 in Appendix N5 shows the location and height of Soundwall S765.

With consideration of the acoustic benefit and the incremental cost, Soundwall S765 is recommended to range from a 14- to 16-ft-high masonry wall, as shown in Figure 9 and Table 3 in Appendix N5.

- **Soundwall S766:** Soundwall S766 would extend an existing 14-ft-high soundwall 145 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at Bushard Street. Although this soundwall would not provide 5 dB of traffic noise reduction for residences in this area, it does reduce the exposure of six single-family residences to additional traffic noise predicted under Alternative 3; therefore, it is recommended. Figure 9 in Appendix N5 shows the location and height of Soundwall S766.

With consideration of the acoustic benefit and the incremental cost, Soundwall S766 is recommended to be a 14-ft-high masonry wall, as shown in Figure 9 and Table 3 in Appendix N5.

- **Soundwall S776:** For Alternative 3, Soundwall S776 would be 251 feet long and located at the edge of the shoulder of the northbound off-ramp to Warner Avenue. The estimated total construction cost of this 12-ft-high wall is \$82,000, which exceeds the reasonable allowance of \$41,000. This soundwall was initially found not reasonable due to cost; however, El Dorado Preschool opened during preparation of the NSR, Amendment 3, and it was found that the predicted peak-hour noise level at the playground would be 75 dBA without a soundwall, which is considered a severe impact. Where severe impacts are identified, unusual and extraordinary abatement must be considered, even if the noise abatement is determined to be unreasonable based on cost.

With consideration of the acoustic benefit, construction of Soundwall S776, required to provide noise abatement for a severely impacted receptor, is recommended to be 12-foot-high masonry wall as shown on Figure 10 and Table 3 in Appendix N5.

- **Soundwalls S786 and S790:** Soundwalls S786 and S790, which act as a system, would be located on the ROW line along the northbound on-ramp from Warner Avenue. Part of this soundwall system would replace an existing soundwall along the northbound on-ramp from Warner Avenue, connect to an existing 12-ft-high soundwall at one end, and follows the ROW along the ramp on the other end.

Soundwall S790 would be a 14-ft-high replacement of a portion of an existing 12-ft-high soundwall, and it would connect to the existing 12-ft-high soundwall at its northernmost end. At its southernmost end, Soundwall S790 would connect to Soundwall S786. These two soundwalls would provide abatement for three single-family residences represented by Receiver R2.81 for Alternative 2. Soundwall S786 would need to be 16 ft in height for Alternative 2. The estimated total construction cost of this 16-ft-high wall is \$120,000, which is equal to the reasonable allowance of \$135,000. Increased wall height would not provide any additional benefited residences.

With consideration of the acoustic benefit, Soundwall S790 is an in-kind replacement and recommended to be a 14-ft-high masonry wall to connect to an existing 12-ft-high soundwall. Soundwall S786 is recommended as a 16-ft-high soundwall to connect to Soundwall S790, as shown in Figures 10 and Table 2 in Appendix N4.

Warner Avenue to Magnolia Street

- **Soundwall S795:** Soundwall 795 would be located on the edge of shoulder of southbound I-405 between Warner Avenue and Magnolia Street. This soundwall would provide traffic noise abatement for the Day's Inn Hotel and Boomers represented by Receivers R2.93 through R2.99. Under Alternative 2, an 8-ft-high soundwall would provide feasible abatement to the outdoor use areas of Boomers. For the Day's Inn Hotel, a 12-ft-high soundwall would be required to provide feasible abatement for the first- and second-floor rooms of the hotel.. The soundwall would be located within a few feet of the building under Alternative 2; rooms located at the third floor would not receive the 5-dB-minimum required noise reduction with a soundwall as high as 16 ft. The estimated total construction cost of S795 for a 12-ft-high soundwall is \$395,000, which is less than the reasonable allowance of \$2,385,000. Figures 10 and 11 in the NSR (Amendment 3) show the locations and heights of these soundwalls.

With consideration of the acoustic benefit, Soundwall S795 is recommended to be a 12-ft-high masonry wall, as shown in Figures 10 and 11 and Table 2 in Appendix N4.

Magnolia Street to Bolsa Avenue/Goldenwest Street

- **Soundwall S834:** The 1,350-ft-long Soundwall S834 located at the edge of the shoulder along the northbound side of I-405 mainline would provide 5 dB of traffic noise reduction for seven single-family residences. The estimated total construction cost of this soundwall is \$523,000, which exceeds the maximum reasonable allowance of \$495,000.

Figure 12 in Appendix A3 of the NSR shows the heights and length of Soundwall S834 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S834 is not reasonable; therefore, it is not recommended.

- **Soundwall S841:** Soundwall S841 would extend the coverage of an existing 12-ft-high soundwall 525 ft to the north along the southbound shoulder of the mainline to compensate for the encroachment of I-405 onto the existing overpass embankment at Newland Street. The minimum required wall heights for Soundwall S841 to meet the feasibility criterion are as shown in Figure 12 in Appendix A3 of the NSR; however, constructing a uniform 16-ft-high wall would provide an additional 1 to 2 dB of noise reduction for residences behind this wall. The estimated total construction cost of \$205,000 for a uniform 16-ft-high wall is less than the reasonable allowance of \$385,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S841 is reasonable and recommended to be a uniform 16-ft-high masonry wall, as shown in Figure 12 and Table 3 in Appendix N5. There are two residences in this area that would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S841 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required for these residences. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for these residences.

- **Soundwall S857:** Soundwall S857 would be 225 ft long and located at the edge of the shoulder along the southbound I-405 on-ramp at Edinger Avenue. The minimum required wall height for Soundwall S857 to meet the feasibility criterion is as shown in Figures 12 and 13 in Appendix A3 of the NSR; however, constructing Soundwall S857 to a uniform 14-ft height would provide an additional 1-dB of noise reduction for the residences behind this wall. The estimated total construction cost of \$82,000 for a uniform 14-ft-high wall is less than the reasonable allowance of \$343,000; therefore, this soundwall is recommended for construction.

With consideration of the acoustic benefit and the incremental cost, Soundwall S857 is reasonable and recommended to be a 14-ft-high masonry wall, as shown in Figures 12 and 13 and Table 3 in Appendix N5.

- **Soundwall S868:** Soundwall S868 would be located at the ROW line of the northbound off-ramp to Beach Boulevard. The estimated total construction cost of this 16-ft-high wall is \$121,000, which exceeds the reasonable allowance of \$35,000. Figure 13 in Appendix A3 of the NSR shows the minimum height and length of Soundwall S868 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S868 is not reasonable; therefore, it is not recommended.

- **Soundwall S896:** Soundwall S896 is located on the I-405 northbound mainline at the ROW and would extend an existing 14-ft-high soundwall 110 ft to the north to compensate for the encroachment of I-405 onto the existing overpass embankment at McFadden Avenue. This soundwall reduces the exposure of nearby mobile homes to additional traffic noise predicted under Alternative 3 due to embankment modification; therefore, it is recommended. Figure 14 in Appendix N5 shows the location and height of Soundwall S896.

With consideration of the acoustic benefit and the incremental cost, Soundwall S896 is recommended to be a 10-ft-high masonry wall, as shown in Figure 14 and Table 3 in Appendix N5.

- **Soundwalls S902, S910, and S916:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S902 is an in-kind replacement of an existing 8-ft-high and 1,110-ft-long wall that would be reconstructed regardless of cost. Soundwall S910 is also an in-kind replacement that would be higher than the existing 450-ft-long soundwall. The 750-ft-long Soundwall S916 is a new wall and, together with Soundwalls S902 and S910, would provide 5 dB of traffic noise protection for five single-family residences in this area. The minimum required wall heights for Soundwalls S910 and S916 to meet the feasibility criterion are as shown in Figures 14 and 15 in Appendix A3 of the NSR. Increased wall heights for Soundwall S910 would not provide any additional acoustic benefits; however, constructing Soundwall S916 as a uniform 14-ft-high wall would provide an additional 2 dB of noise reduction for two of the residences behind this wall. The total construction cost of Soundwall S916 and the additional height requirement of Soundwall S910 are estimated to be \$292,000, which is less than the reasonable allowance of \$315,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S910 is recommended to be between a 10- and a 12-ft-high masonry wall, and Soundwall S916 is recommended to be a 14-ft-high masonry wall, as shown in Figures 14 and 15 and Table 3 in Appendix N5.

- **Soundwalls S907 and S141:** These soundwalls would be located at the edge of the shoulder along the southbound side of I-405. Soundwall S141 is an in-kind replacement of an existing 8-ft-high and 1,525-ft-long soundwall on the shoulder of the road and a portion of a 12-ft-high soundwall on the ROW line. The replacement for the 12-ft-high wall would be at the shoulder of the road, and it would be 8 ft high because the shoulder elevation is approximately 4 ft higher than the ROW line. Due to the elevation difference, the top of the wall of the 8-ft-high replacement soundwall would be the same as the existing 12-ft-high soundwall. Soundwall S141 would be reconstructed regardless of cost. Soundwall S907 is a new wall and provides 5 dB of traffic noise protection for College Park. The minimum required wall height for Soundwall S907 to meet the feasibility criterion is shown in Figure 14 in Appendix A3 of the NSR and increased wall height would not provide any additional acoustic benefits. The estimated total construction cost of Soundwall S907 is \$232,000, which is less than the reasonable allowance of \$270,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S907 is recommended to be a 10- to 12-ft-high masonry wall, as shown in Figure 14 and Table 3 in Appendix N5.

- **Soundwall S935:** Soundwall S935 is located at the ROW line along the southbound I-405 on-ramp from Bolsa Avenue. The minimum required wall heights for Soundwall S935 to meet the feasibility criterion are as shown in Figure 15 in Appendix A3 of the NSR, providing 5 dB of traffic noise protection for one of the residences behind this wall; however, constructing Soundwall S935 as a uniform 16-ft-high wall would provide 5 dB of noise reduction for four of the residences in this area. The estimated total construction cost of this 16-ft-high wall is \$147,000, which is less than the maximum reasonable allowance of \$180,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S935 is recommended to be a 16-ft-high masonry wall, as shown in Figure 15 and Table 3 in Appendix N5.

Bolsa Avenue/Goldenwest Street to SR-22/Valley View Street, SR-22 East to Springdale Street

- **Soundwalls S182, S972, and S978:** These soundwalls, which act as a system, would be located at the edge of the shoulder along the northbound side of I-405. Soundwall S182 is an in-kind replacement of an existing 10-ft-high (1,810-ft-long) wall and would be reconstructed regardless of cost. Soundwall S972 is also an in-kind replacement that would be higher than the existing 310-ft-long soundwall. The 990-ft-long Soundwall S978 is a new wall and, together with Soundwalls S972 and S182, would provide 5 dB of traffic noise protection for Buckingham Park and Westminster High School. The minimum required wall heights for Soundwalls S972 and S978 to meet the feasibility criterion are as shown in Figures 16 and 17 in Appendix A3 of the NSR; however, constructing Soundwall S978 to range from 14- to 16-ft in height would provide an additional 1-dB of noise reduction for the park and school behind this wall. The total construction cost of Soundwall S978 and the additional height requirement of Soundwall S972 are estimated to be \$392,000, which is less than the reasonable allowance of \$407,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S972 and S978 are recommended to range between 14- to 16-ft-high masonry walls, as shown in Figures 16 and 17 and Table 3 in Appendix N5.

- **Soundwall S995:** The 200-ft-long Soundwall S995 would be located at the ROW line along the southbound side of I-405 and would replace an existing soundwall at the same location with new height. The minimum heights and length of Soundwall S995 to provide feasible abatement are as shown in Figure 17 in Appendix A3 of the NSR. The estimated total construction cost of this soundwall is \$81,000, which exceeds the reasonable allowance of \$78,000, and because there is an existing soundwall at this location, construction of this wall is not recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S995 is not reasonable; therefore, it is not recommended.

- **Soundwall S998:** Soundwall S998 would be located at the ROW line along the northbound side of I-405 and would extend an existing soundwall 140 ft to the north. Figure 17 in Appendix A3 of the NSR shows the height and length of Soundwall S998 to provide feasible abatement; however, constructing this soundwall as a 16-ft-high wall would provide an additional 2 dB of noise reduction for the residences behind this wall.

The estimated total construction cost of this soundwall at \$53,000 is less than the reasonable allowance of \$94,000 for a height of 16 ft; therefore, it is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S998 is reasonable and recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 3 in Appendix N5.

- **Soundwall S1006:** Soundwall S1006 would be 330 ft long and located at the ROW line along the northbound off-ramp to Westminster Avenue. The minimum required wall height for Soundwall S1006 to meet the feasibility criterion is 10 ft, as shown in Figure 17 in Appendix A3 of the NSR; however, constructing a 16-ft-high soundwall would provide an additional 4 dB of noise reduction for the exterior and interior areas of Motel 6 behind this wall. The estimated total construction cost of this 16-ft-high wall is \$123,000, which is less than the reasonable allowance of \$385,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, construction of Soundwall S1006 is reasonable and recommended to be a 16-ft-high masonry wall, as shown in Figure 17 and Table 3 in Appendix N5. The outdoor pool area and the interior rooms of Motel 6 would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without a soundwall in place. If Soundwall S1006 is determined to be unreasonable based on cost during the project design phase, providing the soundwall would still be required at this location. If building a soundwall is not reasonable due to other factors besides cost, then building other types of abatement must be considered for the pool area and interior rooms facing the freeway; however, the owner of the motel may decline construction of the soundwall because it would block their visibility from the freeway.

- **Soundwalls S1005 and S1009:** Soundwall S1005 would replace and heighten an existing 175-ft-long soundwall at its current location, and the 850-ft-long Soundwall S1009 would extend the coverage of Soundwall S1005 to the north along the southbound on-ramp from Westminster Avenue, providing traffic noise reduction for Cascade Park and residences in this area. The minimum required wall heights for these soundwalls to meet the feasibility criterion are as shown in Figures 17 and 18 in Appendix A3 of the NSR; however, constructing Soundwall S1009 to a height of 16 ft would provide an additional 1 to 2 dB of noise reduction for the park behind this wall. The total construction cost of Soundwall S1009 and the additional height requirement of Soundwall S1005 are estimated at \$320,000, which is less than the reasonable allowance of \$583,000; therefore, these soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1005 is recommended to be a 12-ft-high masonry wall, and Soundwall S1009 is recommended to be a 16-ft-high masonry wall, as shown in Figures 17 and 18 and Table 3 in Appendix N5. The park area and residences behind these walls would be severely impacted due to predicted peak-hour noise levels at or above 75 dBA without soundwalls in place. If Soundwalls S1005 and S1009 are determined to be unreasonable based on cost during the project design phase, providing the soundwalls would still be required at these locations. If building a soundwall is not reasonable due to other factors besides cost, then other types of abatement must be considered for potential noise impacts in the interior of the land use.

- **Soundwalls S1016, S1020, S1022, and S1024:** Soundwalls S1016 and S1020 would be located at the edge of the shoulder along the northbound on-ramp from Westminster Avenue, and Soundwalls S1022 and S1024 would be located within the ROW. Soundwalls S1020 (325 ft long) and S1022 (200 ft long) would be in-kind replacement soundwalls with a new height. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A3 of the NSR; however, constructing Soundwall S1016 as a uniform 16-ft-high wall would provide an additional 1-dB of noise reduction for the school playground area. The total construction cost of Soundwalls S1016 and S1024, including the additional height requirement of Soundwalls S1020 and S1022, is estimated to be \$349,000, which is less than the reasonable allowance of \$392,000; therefore, all four soundwalls are recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwalls S1016, S1020, S1022, and S1024 are recommended to be 16-ft-high masonry walls, as shown in Figure 18 and Table 3 in Appendix N5.

- **Soundwalls S1026 and S1028:** Soundwalls S1026 and S1028 would be located at the ROW line along the northbound I-405 mainline. Soundwall S1028 replaces and heightens a 75-ft portion of an existing soundwall at its current location, and Soundwall S1026 extends the coverage of Soundwall S1028 farther south. The minimum required heights for these soundwalls to meet the feasibility criterion are as shown in Figure 18 in Appendix A3 of the NSR. The total construction cost of Soundwalls S1026 and S1028 is estimated to be \$73,000, which exceeds the reasonable allowance of \$47,000; however, building Soundwall S1026 at 14 ft high reduces the exposure of four single-family residences to additional traffic noise predicted under Alternative 3 due to encroachment of I-405 onto the existing embankment at Springdale Street and, therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1028 is not recommended and Soundwall S1026 is recommended to be a 14-ft-high masonry wall, as shown in Figure 18 and Table 3 in Appendix N5 of this report.

- **Soundwall S1083:** Soundwall S1083 would be located at the ROW line along the southbound I-405 mainline along Valley View Street. The minimum required heights for this soundwall to meet the feasibility criterion are as shown in Figure 20 in Appendix A3 of the NSR; however, constructing Soundwall S1083 as a 14- to 16-ft-high wall would provide an additional 1 to 2 dB of noise reduction for the residences behind this wall. The total construction cost of Soundwall S1083 is estimated to be \$194,000, which is less than the maximum reasonable allowance of \$255,000; therefore, this soundwall is recommended.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1083 is recommended to be a 14- to 16-ft-high masonry wall, as shown in Figure 20 and Table 3 in Appendix N5.

Valley View Street to Seal Beach Boulevard

- **Soundwall S1162:** Soundwall S1162 would be located at the edge of the shoulder along the northbound side of I-405 and would extend an existing soundwall 700 ft along the northbound side. The total construction cost of this 12-ft-high wall is estimated to be \$225,000, which is less than the reasonable allowance of \$270,000.

With consideration of the acoustic benefit, construction of Soundwall S1162 is reasonable and recommended to be a 12-ft-high masonry wall, as shown in Figure 23 and Table 3 in Appendix N5.

Seal Beach Boulevard to I-605

- **Soundwall S1226:** The purpose of Soundwall S1226 is to extend the coverage of an existing soundwall 440 ft north to compensate for the encroachment of I-405 onto the existing northbound I-405 to westbound SR-22 embankment that would occur under Alternative 3. The estimated total construction cost of this wall is \$163,000, which exceeds the maximum reasonable allowance of \$141,000; however, this soundwall reduces the exposure of nine single-family residences to additional traffic noise predicted under Alternative 3 due to embankment modification and therefore is recommended. Figure 25 in Appendix N5 shows the height and length of Soundwall S1226 to provide feasible abatement.

With consideration of the acoustic benefit and the incremental cost, Soundwall S1226 is recommended to be a 16-ft-high masonry wall, as shown in Figure 25 and Table 3 in Appendix N5.

Residual Effects after Abatement:

Due to the proposed soundwalls or the replacement of existing soundwalls with additional heights, the receptors on the opposite side of the walls may experience slightly more traffic noise.

Temporary Impacts

Construction noise varies greatly depending on the construction process, type, and condition of the equipment used, and layout of the construction site. Projections of potential construction noise levels may vary from actual noise experienced during construction due to these factors. Overall, construction noise levels are governed primarily by the noisiest pieces of equipment. The engine, which is usually diesel, is the dominant noise source for most construction equipment.

In general, construction activities conducted during daytime hours would have a lesser impact on residential land uses than nighttime construction; however, nighttime construction is expected to be necessary to avoid unacceptable disruptions to traffic during daytime hours.

With implementation of measures NOI-2 and NOI-3, temporary construction noise impacts would be minimized.

3.2.7.4 Avoidance, Mitigation, and/or Minimization Measures

Noise Abatement Build Alternatives

NOI-1: Design and install noise barriers at the locations as recommended in the NADR, as shown for the build alternatives in Appendix N, Sections N3, N4, and N5.

Based on the studies completed to date, the Department intends to incorporate noise abatement in the form of (a) barrier(s) at: several locations, with respective lengths and average heights as shown in NADR. Calculations based on preliminary design data show that the barrier(s) will reduce noise levels by 5 to 12 dBA for abutting residences at a cost of \$12,850,000. If during final design conditions have substantially changed, noise abatement may not be necessary. The final decision of the noise abatement will be made upon completion of the project design and the public involvement processes.

All noise abatement options were considered; however, because of the constrained configuration and suburban location of the proposed project, construction of noise barriers are the only abatement measure considered practical. Only noise barriers recommended in the NADR analysis would be included for implementation in this Final EIR/EIS.

NOI-2: Sound control shall conform to the provisions in Section 14-8.02, "Noise Control," of the Standard Specifications. According to requirements of this specification, construction noise cannot exceed 86 dBA at 50 ft from the jobsite activities from 9:00 p.m. to 6:00 a.m.

NOI-3: All internal combustion engines shall be equipped with the manufacturer-recommended muffler. An internal combustion engine cannot be operated on the jobsite without the appropriate muffler.

NOI-4: The contractor shall prepare a Noise and Vibration Monitoring and Mitigation Plan by a qualified Acoustical Engineer and submit it for approval. The Plan must outline noise and vibration monitoring procedures at predetermined noise and vibration sensitive sites, as well as historic properties. The Noise and Vibration Monitoring and Mitigation Plan also must include calculated noise and vibration levels for various construction phases and mitigation measures that would be needed to meet the project specifications. The contractor shall not start any construction work or operate any noise-generating construction equipment at the construction site before approval of the Noise and Vibration Monitoring and Mitigation Plan. The Noise and Vibration Monitoring and Mitigation Plan must be updated every 3 months or sooner if there are any changes to the construction activities.

NOI-5: It is predicted that construction activities that use vibratory compaction rollers and pile drivers could cause some human annoyance impacts. There are cases where it may be necessary to use this type of equipment in close proximity to residential and commercial buildings. The following procedures could be used to minimize the potential for human annoyance from construction vibration:

- Conduct vibration monitoring during vibration-intensive activities.
- Properly maintain all motorized equipment in a state of good repair to limit wear-induced vibration.

- Where feasible, avoid the use of impact-type pile driving near residences; instead use drilled piles or the use of a sonic or vibratory pile driver, which cause lower vibration levels (where geological conditions permit their use).
- When there is a possibility of human annoyance from construction activities, such as the operation of vibratory rollers, absent urgent and unexpected circumstances, conduct such activity only during weekday daytime hours when the ambient background noise and vibration is higher and many residents are away from their homes at work.
- Develop a phasing plan so that high vibration-generating activities do not occur within the same time period in close proximity to each other, to the maximum extent practicable.
- Avoid the use of large vibratory rollers and packers near sensitive areas, when possible, and use smaller equipment with smaller lifts.

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